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Andrew Newell and Francesco Pastore

School of Social Sciences, University of Sussex, Brighton, BN1 9SN, U. K.

REGIONAL UNEMPLOYMENT AND INDUSTRIAL RESTRUCTURING IN POLAND

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Abstract

This paper studies regional unemployment inequality in Poland. We find that higher unemployment regions have experienced greater change in industrial structure. We also find high unemployment regions are those with higher inflow rates to unemployment rather than longer spells of unemployment. These findings suggest that unemployment varies importantly with job destruction in Poland. Econometric analysis of the probability of flowing into unemployment from a job reinforces this impression. It also allows estimation of the extent to which regional unemployment variation is due to economic restructuring.

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1. Introduction

The regional pattern of the unemployment that emerged in Poland in 1990 persisted, to a large extent, well beyond the middle of the decade. This persistence was a modest surprise; the OECD (1997), among others, noted it. It could plausibly have been different. The transition might have thrown up a rapid series of localised unemployment explosions and a fast-changing geographical picture.

The standard explanation of Poland's unemployment is that it reflects structural changes in labour demand caused by domestic economic reforms, direct foreign investment, and shifts in the pattern of Poland's international trade. See, amongst others, Burda (1993), Aghion and Blanchard (1994) and Blanchard (1997). To reconcile a fairly stable regional pattern of unemployment with this explanation, one needs to add arguments why unemployment might persist. There are two main types of argument. Firstly, there are many reasons why restructuring and privatisation are gradual rather than all at once. This could give rise to a steady flow of mismatched workers into unemployment. Secondly, the persistence of mismatch unemployment may be reinforced by labour immobility caused by, for instance, adjustment costs in labour supply or wage rigidity. A combination of these theories

creates a seemingly convincing story in which gradual restructuring and supply-side rigidities combine to create persistence in the regional pattern of unemployment.

Poland in the 1990s is a good context for studying the impact of economic restructuring on unemployment. In the mid to late 1980s there was quite a large volume of research attempting to quantify the contribution of structural change to aggregate unemployment among the OECD countries, see Layard *et. al.* (1991), but this fell short of analysing regional patterns of unemployment, and the results were inconclusive. Layard *et. al.* (*op. cit.*) argue regional unemployment differentials reflect geographical mismatch which might be caused by equilibrium supply-side factors and by differences in the degree of economic restructuring. However, the relative importance of these two elements is not convincingly established. More recent empirical studies of regional unemployment have ignored differences in the rate of economic restructuring, and have been concerned to quantify the medium-term effects of supply-side rigidities, see *inter alia* Blanchard and Katz (1992) and Jimeno and Bentolilla (1998).

This paper attempts to quantify the extent to which regional variation in unemployment in Poland can be attributed to economic restructuring. Our approach is, as far as we know, novel. We think it could serve as a method of analysing this question in other countries.

In section 2, we describe the evolution of regional unemployment in Poland. We show that existing economic classifications of regions are not well correlated with unemployment rates. We also show how regional indices of economic restructuring are highly correlated with unemployment. In section 3, we look at flows into and out of unemployment. We show inflow rates and indices of economic restructuring are highly correlated. We also show that unemployment differences across regions are essentially differences in inflow rates rather than outflow rates. In section 4 we model the process of inflow to unemployment in both high and low unemployment regions. Lastly, by studying regional differences in estimated coefficients, we estimate the maximum contribution of restructuring to the unemployment gap between high and low unemployment regions. We suggest an upper bound of about two-thirds.

2. Unemployment, economic structure and structural change

2.1 The data

Until 1998, Poland was divided into 49 counties, or voivodships (*wojewodstwa*). The OECD (1997), amongst others, noted the stability of the distribution of unemployment across voivodships through the 1990s. This persistent regional pattern was perhaps one of the surprises of the 1990s unemployment data. The visual evidence of relative stability in Chart 1 is supported by the correlation coefficients in Table 1 below.

Chart 1

Regional unemployment rate persistence in Poland (1992-1997)
(% of the labour force)

Source: own calculations from the Polish Labour Force Survey (PLFS).

Table 1: Correlation coefficients among unemployment rates (1992-1997)

	1994	*1995*	*1996*	*1997*
1992	0.71**	0.76**	0.71**	0.73**
1994		0.81**	0.77**	0.73**
1995			0.81**	0.81**
1996				0.86**

*Note: ** denotes significance at the one-percent level.*
Source: own calculations from PLFS data.

2.2 Understanding the regional distribution of unemployment

The regional distribution of unemployment in Poland is not simply related to income levels. Gorzelak (1996) notes that unemployment rates and per capita GDP are not significantly correlated across voivodships. Also, there is little difference in mean unemployment between the traditionally more prosperous regions of the West and the more backward regions of the East. Of course, some intuitive expectations are fulfilled; for instance unemployment has been much lower in Warsaw, and there has been high unemployment in the eastern agricultural regions for most of the decade. Three previous studies have produced classifications of voivodships by economic structure: Scarpetta and Huber (1995), Góra and Lehmann (1995) and Lehmann and Walsh (1998). These are presented in Table A1 of the Appendix. We discuss each briefly.

Scarpetta and Huber (*op. cit.*) aim to capture both the degree of economic development and the structure of industry in a single index. Economic development is proxied by an index of industrial diversification. They classify regions into the following six groups: I - developed agricultural; II - other agricultural; III - developed heavily industrialised; IV - other industrialised; V - developed diversified; VI - other diversified.

Gòra and Lehmann (*op. cit.*) also classify voivodships by the degree of economic development of a region. Their index is based on the following characteristics: the employment shares of services and industry in 1990, the relative change in total employment and that of employment in services and the relative per capita income of municipalities in 1992. Finally the voivodships are divided into

six groups, which the authors take to represent progressive stages of economic development.

Lehmann and Walsh (*op. cit.*) build an economic classification of voivodships with a different proposed interpretation. Their intention is to produce an index reflecting the degree of employment *restructuring*. Seven indicators are employed: the share of services in employment; the share of short-tenured men (i.e. with tenure less than ten years) in total male employment; the number of telephones per capita; the voivodship shares of domestic and direct foreign investment, normalised on population; the share of construction in total employment and the share of agriculture in total employment.

These three classifications all reflect differences in the economic structure. The Lehmann-Walsh index, though interpreted as reflecting structural change, actually contains no component measured as a temporal difference. It is better to interpret it as a measure of economic structure or perhaps of the state of development.

A comparison of the mean unemployment rates of voivodships in the six Scarpetta-Huber categories reveals no significant differences. The correlations between voivodship unemployment rates and the latter two structural indices are given in Table 2. Though the indices correlate fairly well with each other, there is no remotely significant correlation with voivodship unemployment rates.

Table 2: Correlating unemployment rates and structural indices by voivodship

	Gora-Lehmann	*Lehmann-Walsh*
Unemployment rate 1992	0.01	0.13
Unemployment rate 1997	0.22	-0.05
Gora-Lehmann	1.00	-0.75**
Lehmann-Walsh		1.00

*Note: ** and * denote significance at the one percent and five percent significance levels.*
Sources: see text.

What is the relationship between regional unemployment rates and the degree of restructuring? In order to study this issue we employ one of the measures of industrial turbulence suggested by Layard, Nickell and Jackman (1991):

$$I_t = \frac{1}{2}\sum_i \left|\Delta s_{it}\right| .$$

Here s_{it} is industry *i*'s share of employment and Δ is the change over a period ending at *t*. We calculate the index using the May 1994 and November 1997 rounds of the Polish Labour Force Survey (PLFS). These were, at the time of writing, the earliest and latest available surveys using a consistent, 32-industry classification. We also calculate similar indices for other dimensions of the transition: by ownership or sector to capture privatisation, and by firm size. Table 3 presents the regional correlations between these restructuring indices and unemployment rates. Clearly, there are strong relationships with respect to industrial change and privatisation.

Table 3: Correlations of structural change and unemployment between voivodships

	Restructuring index, $I_{94,97}$, by		
	Industry	*Sector*	*Firm size*
Unemployment rate 1995	0.44**	0.45**	0.28
Unemployment rate 1996	0.47**	0.51**	0.33*
Unemployment rate 1997	0.51**	0.54**	0.35*

*Note: ** denotes significance at the one-percent level.*
Source: own calculations from PLFS.

To summarise this section, we have found virtually no relationship between indices of economic structure and regional unemployment rates. By contrast, there is strong correlation between regional unemployment rates and indices of recent industrial change or turbulence in employment.

3. Labour markets in high and low unemployment voivodships

3.1 Unemployment flows

The correlations in Table 3 suggest a link between the degree of industrial restructuring and the pattern of regional unemployment. What other evidence can we use to substantiate this idea? Consider Chart 2. Here we employ the quasi-panel nature of the Polish Labour Force Survey to calculate the rates of flow from employment to unemployment for three cohorts, observed between November 1994 and November 1997[i]. On the horizontal axis is the sum, over the three cohorts, of rates of flow from employment to unemployment. On the vertical axis is the November 1996 unemployment rate. The chart shows a positive relationship (the correlation coefficient is 0.76, significant at the one - percent level). High unemployment voivodships tend to be regions of high flows from employment to unemployment. This is as one might expect, if industrial turbulence was a major cause of the regional pattern of unemployment.

Chart 2

Voivodship unemployment stocks and inflows

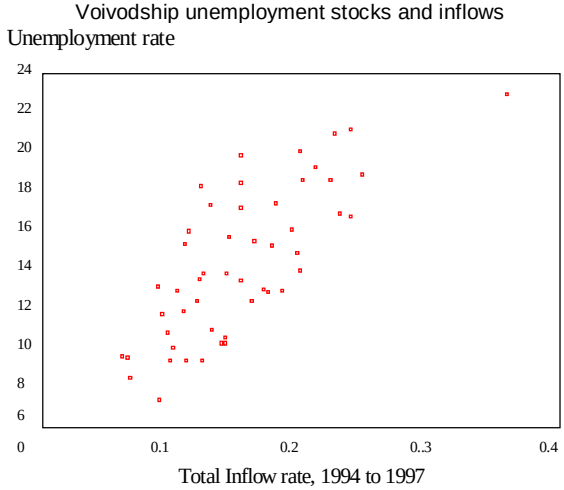


Table 4 gives correlations between inflow rates, outflow rates, unemployment rates and our index of structural industrial change. Inflow rates and industrial change are strongly correlated, as are inflow rates and unemployment rates. As we have already seen, unemployment and structural change are also significantly correlated. Lastly unemployment and outflow rates are significantly correlated, though outflow rates are uncorrelated with inflow rates and industrial change.

Table 4: Correlation matrix for inflows, outflows, unemployment rates and industrial change across voivodships

	Average outflow rate 1994-1997	*Average unemployment rate 1994-1997*	*Industrial change index I_{94-7}*
Average inflow rate 1994-1997	-0.25	0.78**	0.45**
Average outflow rate 1994-1997		-0.45**	-0.03
Average unemployment rate 1994-1997			0.55**

Source: Author's calculations from the PLFS.

Of course, looking at unemployment stocks and flows alone does not give a full picture of labour market movements. What follows is a comparison of all the labour market flows in voivodships. In order to keep the amount of statistics to a manageable level, we first rank voivodships by unemployment rate. We discard a group of medium unemployment regions and end up with 12 low and 20 high unemployment voivodships, each representing approximately 34 per cent of total employment. The low unemployment group includes some of the most densely populated, urban and industrial regions of the country.

We further confine ourselves to reporting results from the cohorts of the Polish Labour Force Survey observed at November 1995 and again at November 1996. The sampling design, a quasi-panel, means that almost 25,000 individuals are interviewed at both dates[ii].

Table 5 presents the characteristics of the working age populations in high and low unemployment regions. In high unemployment regions workers are a little younger and quite a lot worse educated. This may be important. The young and the less well educated tend universally to have higher unemployment rates. The aggregate participation rates in the two regions are almost identical. Also, households in the high unemployment regions contain slightly more adults.

Table 5: Characteristics of the working age populations in low and high unemployment voivodships, Poland, November 1995. (Percentage shares)

	Low unemployment regions	*High unemployment regions*
Under 35 years of age	35.4	37.1
Highest level of education:		
Above secondary	10.4	8.1
Secondary	26.3	24.1
Lower vocational	27.3	25.5
Primary or lower	36.0	42.3
Mean number of adults per household	2.45	2.53
Participation rate (%)	57.7	57.8
Unemployment rate (%)	10.8	19.3

Source: Author's calculations from the PLFS.

Tables 6 and 7 below provide summary statistics of changes in economic status between November 1995 and November 1996 that re-emphasise an important fact. The key difference between the high- and low unemployment voivodships is in rates of flow from employment to unemployment, rather than out of unemployment. Of those employed in the low unemployment regions in November 1995, 6% were not working a year later. In the high unemployment regions the corresponding percentage was 9.1%, half as high again. This seems an unambiguous indicator of greater turbulence and job destruction in the high unemployment regions.

Among the low unemployment counties 46.6% of those unemployed at November 1995 were also unemployed at

November 1996. For the high unemployment counties this percentage was a little higher, at 54.5%. This means that in 1996 those with a spell of unemployment longer than 12 months represented a share of 58.1 in low and 64.0% in high unemployment regions. Given this small difference, it would be hard to make the case that high unemployment regions are pockets of especially long-duration unemployment. By contrast, the difference in inflow rates to unemployment from employment was proportionally large: 4.4% in the high unemployment counties compared to 2.5% in the low unemployment counties, almost a factor of two. Similar differences exist among the 1994/5 and 1996/7 cohorts, though they are not reported here.

Table 6: Changes in labour market status in low unemployment regions of Poland 1995/6

		1996		
1995	*Employed*	*Unemployed*	*Non participating*	*Total*
Employed	94.0	2.5	3.5	100
Unemployed	36.3	46.6	17.1	100
Non participating	5.0	2.1	93.0	100

Source: Own calculation from PLFS.

Table 7: Changes in labour market status in high unemployment regions of Poland 1995/6

		1996		
1995	*Employed*	*Unemployed*	*Non participating*	*Total*
Employed	90.9	4.4	4.7	100
Unemployed	31.5	54.5	14.1	100
Non participating	4.6	2.7	92.6	100

Source: Own calculation from PLFS.

If we use the data in Tables 5, 6 and 7 to calculate equilibrium unemployment rates, then we find a rate of 7.2 per cent for the low unemployment regions and a rate of 12.6 per cent for the high

unemployment regions. Of course, these data are net flow data, so that significant unrecorded changes in state during the year would raise the rates considerably[iii]. However, almost all of the difference in these equilibrium unemployment rates is due to the difference in inflow rates from employment. This is illustrated by the fact that the actual unemployment rates, the equilibrium unemployment rates and the rate of flow from employment to unemployment are all about 70 percent higher in the high unemployment voivodships.

Both of these results, of major differences in inflows from employment and minor differences in outflows from unemployment might come as a surprise to economists who have become used, over the last decade or so, to expecting that persistent unemployment differentials will reflect differences in durations of unemployment. Nevertheless the results are consistent with our earlier finding of a positive relationship between regional unemployment and industrial change in employment.

Table 8: Changes in labour market status in international comparison (Annual percentage flow rates)

	Unemployment to Employment	*Employment to Unemployment*
Poland, low unemployment voivodships, 1995/6	36.3	2.5
Poland, high unemployment voivodships, 1995/6	31.5	4.4
Italy, 1994/5	13.1	1.6
United States, 1992/3	65.9	2.8
Russia, 1994/5	40.8	3.7

Sources: Poland, Tables 7 and 8; Italy, own calculation based on data from the Rilevazione Trimestrale delle Forze di Lavoro*; United States and Russia, Boeri, (1997).*

Table 8, above, allows a comparison of flows to and from employment and unemployment between Poland, Italy, the United States and Russia. Italy is one of Western Europe's high unemployment countries, with very low levels of flows in either direction. The Italian flow rates are about 40% of the level of the rates in the high unemployment voivodships in Poland. In other words, a Polish worker in a high unemployment voivodship is two and a half times more likely to lose her job than her Italian

counterpart. The same is true for job-finding; the Italian worker's expected duration of unemployment is two and a half times that of her Polish counterpart in a high unemployment voivodship. In contrast to Italy, among the OECD countries the United States has the highest labour market turnover. Certainly, from the data above, a worker in the United States is more likely to leave unemployment within a year than her Polish counterpart. On the other hand, the flow rate from employment to unemployment is actually lower in the United States, probably reflecting lower economic restructuring.

4. Modelling job loss

4.1 Differences in characteristics

In this section we model the process of flowing from employment to unemployment. In order to carry out empirical work on the inflow to unemployment, we took one of our subsamples from the PLFS, employees who were working in November 1995 and re-interviewed in November 1996. Using information for November 1996, we calculate the length of job tenure. Table A2 in the Appendix gives the characteristics of the employees in our samples for low and high unemployment regions. The most noteworthy feature of the table is the small scale of the differences between the workers of the two regions, particularly in terms of industrial structure.

Nonetheless, the private sector is slightly larger in high unemployment voivodships. Also, high unemployment counties have, on average, slightly higher shares of agriculture, manufacturing and public services and lower share of mining. These higher unemployment regions also have fewer large firms. Thus the differences that do exist are suggestive of greater job fragility.

Looking at occupational difference, high unemployment regions have on average a lower share of employment in human

capital-intensive jobs. High unemployment regions also have lower average job tenure. The higher share of jobs started after 1989 illustrates the greater turbulence of high unemployment regions. This is 43 per cent of all jobs against 37.9 percent in low unemployment regions.

4.2 Estimating hazard functions of job loss

In previous related studies, Góra and Lehmann (1995) and Boeri and Scarpetta (1995 and 1996) both assumed that the past history of workers does not affect their probability of flowing between different labour market states. As a consequence, they modelled labour market flows as a Markov process in which the probability of transition is dependent only on individual heterogeneity and other environmental factors. The data we use refer to a later period of economic transition. This would not be a satisfactory way to analyse our data. Five years after the implementation of the first privatisation plans, the idea that worker's experience is irrelevant to the chances of job loss seems much less likely to be appropriate.

Our data, from two interviews a year apart, do not give a full account of labour market activity over the intervening year for every worker. Details of the approximations we make in these cases are discussed in the Appendix. We chose to develop our empirical work estimating only the chances of becoming unemployed. We treat other flows from employment, such as job to job flows and retirements, exactly as uninterrupted jobs. This could be thought of as unsatisfactory, compared to a competing risks approach to all departures from the current job.

We apply the Cox's (1972) semiparametric procedure to estimate the hazard function and the effects of the covariates on outflow from employment to unemployment. Lancaster (1990) includes Cox's model in the family of *piecewise-constant* statistical models of changes in status. It is very similar to the model of Meyer (1990), and it avoids the problem of imposing strong parametric assumption in the shape of the baseline hazard. The cumulative hazard is the product of two components:

$$H_t = \lambda_t e^{\beta' X},$$

Here λ_t represents the baseline function, specifying the part of the cumulative hazard that is independent of the covariates, *x*.

Newell and Pastore (1999) estimated Cox models separately for both high and low unemployment regions, see table A4 in the Appendix. In unpacking the effects of sample characteristics, baseline hazards and estimated coefficients, they found that one set of coefficients are primarily responsible for the difference in inflows between the high and low unemployment regions. The key effect came from the role of the worker's age in the regressions. They allowed a spline in age with slope changes at ages 25, 35 and 45 and the difference between the low and high voivodships was that middle-aged workers in high unemployment regions have almost no greater job security than young workers. This is in clear contrast to the situation in the low unemployment regions where young workers are much more likely to enter unemployment than their older colleagues are. Thus in those regions the risk of unemployment does not diminish with age, as is normally the case (See Arulampalam and Stewart, 1995). Looking back at the raw flow data, they find that this parametric difference has its origins in the large gap between the inflow rates for the 25-45 year age group in high and low unemployment regions.

These results suggested that we should study separately the behaviour of prime aged (25 to 45 years) workers. Tables 9 and 10 give prime-aged workers flows for the period 1995 and 1996. The regional difference in the inflows from employment to unemployment, previously noted is even more pronounced here.

Table 9: Changes in labour market status in low unemployment regions of Poland 1995/6, prime aged workers

	1996			
1995	*Employed*	*Unemployed*	*Non participating*	*Total*
Employed	95.6	2.6	1.8	100
Unemployed	34.8	51.6	13.6	100
Non participating	13.1	6.9	80.5	100

Source: Own calculation on PLFS.

Table 10: Changes in labour market status in high unemployment regions of Poland 1995/6, prime aged workers

	1996			
1995	*Employed*	*Unemployed*	*Non participating*	*Total*
Employed	92.8	4.9	2.4	100
Unemployed	30.1	58.7	11.2	100
Non participating	11.9	6.5	81.6	100

Source: Own calculation on PLFS.

Table 11 reports estimates of a Cox unemployment hazard model for prime-aged workers. The model was initially estimated jointly for the high and low unemployment regions, allowing different effects for each explanatory variable for the two regions, and differing baseline hazards. The estimates in Table 11 are the results of a modest and statistically acceptable simplification from a more general model.

The estimated effects can be grouped as follow. First, a set of personal characteristics: age, gender and marital status. We test for and accept the hypothesis that the age effects are common across both regions. Following long-standing tradition in labour economics, we allow a quadratic in age. Our estimates find that between the ages of 25 and 45, the probability of entering unemployment declines until the age of 41, from whence it begins to rise. The gender and marital status effects are insignificant.

The second group of effects relates to education, here measured at the highest completed level. Education is estimated to protect a worker from unemployment, though few coefficients are significant. These effects are larger in higher unemployment regions. The only statistically significant effect is for higher education in high unemployment voivodships.

The third and forth groups of effects are industrial and sectoral. In low unemployment areas, working in manufacturing gives significant job protection. This relative safety of manufacturing is non-existent in high unemployment voivodships. We investigate this further below. Fourthly, working in the state

sector generally protects a worker, but less so in high unemployment regions.

The fifth and sixth groups of effects come from occupation and firm size. Again, higher skills tend to protect against unemployment, but workers in higher skilled occupations are less well protected in high unemployment regions. Sixthly, working in smaller firms is generally more risky, and particularly so in high unemployment regions.

Lastly, we investigate whether voivodship level indices of structural change impact directly on the chances of moving into unemployment. We find that our index of industrial change has a significant effect. This index is high on average for the high unemployment voivodships, so that the estimated effect raises the chances of falling into unemployment in the high unemployment counties about 20 percent over that of the low unemployment voivodships.

We add an alternative index of structural change, due to Lilien (1982), but this proved insignificant. Our final experiment of this type is to add the Herfindahl index of industrial concentration used by Curtis (1988) and Curtis and Nardinelli (1992). Our hypothesis is that the higher the degree of diversification in employment the lower the impact of adverse supply shocks. This proved insignificant[iv]. We calibrate the scale of the effect, however. On average in high unemployment regions the index is lower than in low unemployment regions. Thus the estimated portfolio effect in the labour market accounts for a modest increase of 4 per cent in the hazard rate[v].

Returning to the manufacturing effect, a shortage of degrees of freedom prevents a full dis-aggregation to the two-digit level. This is a pity because it disallows generalisations about which manufacturing sectors generate the most protection from unemployment in the low unemployment regions. It is fairly natural to hypothesise that new patterns of production will be generated by changes in the pattern of international trade and foreign direct investment.

As a limited further investigation, we re-estimate the equation presented in Table 11, grouping industries by factor intensities. We adapt the taxonomy of Neven (1995)[vi]. This taxonomy creates clusters of industries, separated by differing intensities of labour,

human capital and physical capital. After a little experimentation we aggregate clusters and are left with three groups. The first is labour intensive, the second is human capital intensive and the third is intensive in both human and physical capital. A subset of the results are given in Table 12, from which it is clear that most of the job security in manufacturing comes from the industries intensive in labour, independent of the level of physical capital. Within this cluster are leather goods, wood and wood products, textiles and metal products.

Table 11: An estimated hazard function of flows from employment to unemployment, Prime-aged workers, Poland, 1995/6

	Lowest unemployment voivodships	*Highest unemployment voivodships*
Age	-0.19	
Age^2/100	0.23	
Woman	-0.14	0.16
Marital status (default = married)	0.45	-0.39
Part-time and temporary jobs	1.71***	1.92***
Completed education:		
University	-0.06	-2.13***
Secondary	0.20	-0.25
Lower vocational	0.42	-0.15
Industry (default = public services)		
Agriculture and fishing	0.04	0.48
Mining	-1.52	
Manufacturing[1]	-1.03**	0.02
Construction	-0.18	0.37
Trade and hotels	-0.09	0.15
Transport and communication	-0.09	0.15
Financial and business services	0.24	0.52
Sector (default = State)		
Self-employed	1.00*	-0.90
Co-operative	0.80	-0.43
Local government	0.85	0.73**
Private sector	1.62***	-0.94***
Occupation (default = low skilled manuals)		
Professional and managerial	-1.62***	-0.81**
Skilled non-manuals	-0.88*	-0.43
Semi-skilled non-manuals	-1.24***	-0.26
Skilled manuals	-0.80**	-0.38
Semi-skilled manuals	-1.46***	-0.41
Farmers	-4.22***	-1.34**
Size of enterprise (default = more than 100 employees)		
Less than six employees	0.67	0.93***
From 6 to 20 employees	0.15	0.82***
From 21to 50 employees	0.53	1.03***
From 51 to 100 employees	0.28	0.20
Indices of structural change		
By industry	0.04*	
Lilien index of industrial change	0.01	
Herfindahl index of industrial concentration	0.02	
Cumulative baseline after one year of job tenure		
Low unemployment voivodship	0.01	
Medium and High unemployment voivodship		0.01
*-2*log-likelhood*	2764	
Change in log-likelihood	445.31	
Overall chi-squared	785.754	
Number of observations	2177	2395

*Note: *, **, *** denote significance at the 10, 5 and 1 per cent levels.*
[1] in high unemployment regions, mining has been aggregated with manufacturing, due to the small size of the sector (see Table A2).

Table 12: Uncovering the effects of manufacturing on the chances of flowing into unemployment

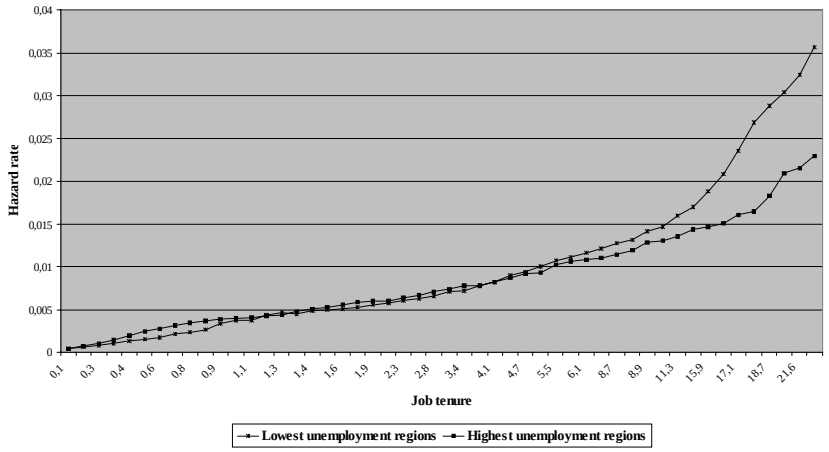
	Lowest unemployment voivodships	*Highest unemployment voivodships*
Intensive in labour, independent of physical capital	-1.29**	0.28
Intensive in human, independent of physical capital	-1.21	-0.46
Intensive in physical and human capital	-0.37	0.27
*-2*log-likelihood*	2760.287	
Change in log-likelihood	449.023	
Overall chi-squared	789.429	
Number of observations	4572	

For notes and conventions, see Table 11 and text.

Chart 4 shows the baseline hazard for high and low unemployment voivodships. It is noticeable that the estimated functions present positive duration dependence, suggesting that the *ceteris paribus* risk of job loss increases with tenure. This is contrary to the hypothesis that tenure be a sort of insurance against firing decisions by firms. It suggests that the restructuring process continue to reduce the share of lifetime jobs[vii]. Moreover, job tenure is higher in low unemployment regions. Nonetheless, the effect seems very small.

Chart 4

Baseline hazard controlling for worker and environmental heterogeneity



4.3 Interpreting the inflow gap

What do these results tell us about the causes of the inflow gap and, ultimately, the unemployment gap between our groups of voivodships? Recall the inflow rate to unemployment from employment for prime-aged workers in high unemployment voivodships is 1.88 times that in low unemployment voivodships. We decompose the estimated relative inflow rate, at some sample mean tenure, into effects due to differences in average voivodship characteristics, and those due to differences in estimated coefficients. Table 13 gives the results. Each cell gives the factor by which each effect magnifies the mean relative probability of entering unemployment.

Table 13: Decomposing the inflow rate gap between high and low unemployment voivodships in Poland 1995/6.

	Estimated inflow rate magnification factor for high unemployment regions
Voivodship characteristics	1.21
Direct effect of structural change indices	1.14
Higher security from education	0.55
Lower security from industrial attachment	1.56
Higher security for self-employed and private sector workers	0.38
Lower security from occupational seniority	2.60
Lower security in smaller firms	1.30
Lower security for women	1.18
Estimated relative risk from the above factors	1.79
Of which, attributable to structural change	1.48

Source, see text.

The penultimate line in Table 13 gives the estimated relative inflow rate. This is the product of all the factors listed above it. We discuss each in turn. First, voivodship characteristics, such as industrial structure account for a 21 percent higher inflow rate in the high unemployment voivodships (HUVs). The direct effects of differences in the levels of our structural change variables account

for a 14 percent higher inflow in the HUVs. The rest of the table is devoted to estimated inflow gaps due to coefficient differences. For instance, in the third row, the greater estimated job security among educated workers in HUVs roughly halves the estimated relative inflow rate. Similarly, in the fifth row, we find the greater relative (with respect to the state sector) job security in the private sector and in self-employment lowers the inflow rate in HUVs. All the other effects are estimated to raise the inflow rate in HUVs. These are industrial (mostly manufacturing), occupational, firm size and gender effects.

Our final question is whether these estimated effects reflect, or partly reflect, structural change. Let us take the educational and occupational effects together. The results tell us that while non-firm specific human capital (education) protects more against job loss in HUVs, seniority (which must partly reflect firm-specific human capital) does not offer such protection. This seems quite consistent with the relative effect one might expect if there were greater structural change in HUVs. Turning to the industry results, it is difficult to give anything but a structural change interpretation to the greater relative job insecurity in manufacturing in HUVs.

The sectoral results suggest much higher relative job insecurity in the public sector in HUVs. Again this is consistent with a structural change interpretation. The same is true of the effects of firm size in relative job insecurity.

The one result that seems fairly difficult to reconcile with structural change is the gender effect. It could be that the greater relative job insecurity of women in the HUVs could reflect greater structural turbulence, if women tend to be more at risk of redundancy.

If we include the gender effect among the possible effects of structural change on the inflow rate, then we arrive at an upper bound for the structural change effect on inflows of 48%, see the last row of Table 12. This is around 2/3rds of the whole gap.

5. Conclusion

We have shown that the persistent high unemployment of some voivodships in Poland is associated more with high inflows to unemployment than with high outflows. Thus it would be wrong to think of these regions simply as pockets of especially long duration unemployment. Moreover, the rate of inflow from employment to unemployment is significantly correlated with the degree of structural change. Our empirical work suggests that perhaps as much as two-thirds of the gap in average inflow rate, and thus in average unemployment rate, between high and low unemployment voivodships could be due to the restructuring of the Polish economy.

It is worth thinking about how our findings illuminate the theories of regional unemployment disparities outlined in section 2. Clearly the transition from the public to the private sector creates turbulence and, in our opinion, higher inflows and stocks of unemployment. What of the labour market rigidities such as nationally negotiated wages and high mobility costs? These rigidities should affect labour mobility and hence the rate of matching workers to jobs. There is no doubt these are potentially important for Poland. However if these theories were important in explaining regional unemployment differences, we would find large differences in the average duration of unemployment, but we do not. If these rigidities are important, they are common, national features of all regions, and at best a minor feature of the regional distribution.

In the analysis of inflows, the first important finding is that the higher inflows in high unemployment regions reflect a very much higher risk of becoming unemployed for middle aged workers, but not for younger and older workers. When the analysis is restricted to this middle-aged people, we find that the manufacturing sector, especially the industries with a high intensity of labour, provide their employees with particularly secure jobs in low unemployment regions. This raises the possibility that these data are capable of demonstrating the extent to which the pattern of employment is responding to the broad changes in the Polish economy. We leave this to future work.

Last but not least, we suggest a modest development in the method of analysing the effects of structural change on unemployment. Previously, researchers had taken regional unemployment gaps as *prima face* evidence of structural unemployment, perhaps related in some unspecified way to changes in economic structure. We have asked and formed a tentative answer to the unspoken question underlying that previous research. The question was how much of the regional variation in unemployment is due to economic structural change? Our upper bound is about two-thirds.

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Appendix

Our definition of low, medium and high unemployment voivodships is based on the average unemployment rate relative to the period 1994-'97. Every group represents about one third of the sample population. Table A1 describes the data used and contrasts the ranking of regions with the three taxonomies discussed in section 2. It confirms the result of Table 2 of scarce correlation between those classifications and the rate of unemployment.

Table A1 - Regional Taxonomies for Poland

N.	Voivodship	u[1]	Active population (%)	Active population (cumulative, %)	SH[2]	GL[3]	LW[4]	Low, Medium and High
63	Poznanskie	8.08	3.32	3.32	V	V	VI	L
95	Zamojskie	8.43	1.35	4.67	II	II	I	L
1	Warszawskie	8.67	5.48	10.15	V	VI	VI	L
35	Krakovskie	9.27	3.36	13.51	V	V	VI	L
75	Skiernewickie	9.72	1.19	14.70	II	I	II	L
7	Bielskie	10.23	2.54	17.24	III	IV	V	L
45	Lomzynskie	10.32	0.94	18.18	II	II	I	L
3	Bialskopodlaskie	10.37	0.81	18.98	II	I	I	L
71	Siedleckie	10.48	1.88	20.86	II	I	I	L
43	Lubelskie	10.51	2.76	23.62	VI	III	IV	L
27	Katowickie	11.04	9.67	33.28	IV	IV	V	L
5	Bialostockie	11.08	1.82	35.10	V	III	III	L
83	Tarnobrzeskie	11.20	1.65	36.75	II	I	II	M
25	Kaliskie	11.47	2.10	38.86	III	III	III	M
55	Ostroleckie	11.49	1.09	39.94	II	II	I	M
73	Sieradskie	11.75	1.05	40.99	II	II	I	M
53	Opolskie	11.94	2.71	43.71	IV	V	V	M
61	Plockie	12.43	1.51	45.22	II	II	III	M
93	Wroklavskie	12.45	2.76	47.97	I	VI	IV	M
85	Tarnowskie	12.63	1.87	49.84	I	II	II	M
15	Czestochowskie	12.71	1.93	51.77	IV	II	III	M
69	Rzeszowskie	12.84	1.94	53.71	VI	I	III	M
19	Gdanskie	13.05	3.39	57.10	V	VI	VI	M
29	Kieleckie	13.06	3.27	60.37	II	II	II	M
59	Piotrkowskie	13.22	1.83	62.20	IV	III	III	M
41	Lesczynskie	13.44	1.09	63.29	VI	II	IV	M
65	Przemiskie	13.72	1.02	64.32	II	I	I	M
49	Nowosadeckie	13.75	1.95	66.27	II	III	II	M
11	Chelmskie	13.84	0.73	67.00	I	I	II	M
97	Zielonogorskie	14.79	1.84	68.84	III	V	V	H
9	Bydgoskie	14.88	2.79	71.64	III	V	V	H
81	Szczecinskie	14.89	2.31	73.94	V	VI	VI	H
47	Lodzskie	14.97	2.92	76.86	III	VI	VI	H
67	Radomskie	15.30	1.94	78.80	II	II	II	H
87	Torunskie	15.38	1.73	80.53	VI	III	IV	H
13	Ciechanowskie	15.66	1.34	81.87	II	II	I	H
57	Pilskie	16.16	1.30	83.17	VI	IV	IV	H
37	Krosnienskie	16.43	1.46	84.63	II	II	I	H
31	Koninskie	16.92	1.26	85.88	II	I	II	H
39	Legnickie	17.30	1.32	87.20	III	IV	V	H
91	Wloclawskie	18.01	1.31	88.52	V	III	II	H
89	Walbrzyskie	18.71	1.79	90.31	IV	V	IV	H
33	Koszalinskie	19.40	1.30	91.61	VI	IV	V	H
51	Olsztynskie	19.52	1.99	93.60	VI	VI	V	H
17	Elblaskie	19.56	1.22	94.83	VI	V	IV	H
21	Gorzowskie	19.70	1.32	96.14	VI	V	IV	H
23	Jelenogorskie	20.87	1.47	97.61	IV	V	V	H
79	Suwalskie	21.95	1.29	98.91	II	II	III	H
77	Slupskie	22.18	0.98	100.00	VI	IV	IV	H
	Total	13.15						

[1] *"u" is the average unemployment rate relative to the period 1994-'97.*
[2] *The SH taxonomy is due to Scarpetta and Huber (1995).*
[3] *The GL taxonomy is due to Góra and Lehmann (1995).*
[4] *The LW taxonomy is due to Lehmann, H. and P. P. Walsh (1998).*

Table A2: Characteristics of employed workers in low and higher unemployment voivodships, November 1995

	All employed workers			*Prime-aged workers*		
	Low	*High*	*Diff.*	*Low*	*High*	*Diff.*
Age (years)	40.3	39.4	0.9**	36.0	35.8	0.2
Share of women (%)	54.5	53.8	1.1	54.0	53.0	1.5
Share of unmarried (%)	14.0	15.0	-1.1	11.0	13.0	-1.3
Tenure at November 1995 (years)	12.8	11.4	1.5**	9.4	9.0	0.4*
Temporary and part-time jobs (%)	6.3	9.4	-3.1**	4.7	7.1	-2.4**
Jobs started after 1989 (%)	37.9	42.8	-4.8**	40.9	43.5	-2.6*
Education (% share)						
University	12.0	11.0	1.0	13.0	11.0	2.1**
Secondary	34.4	34.6	0.2	36.4	39.1	-2.7*
Lower vocational	34.0	32.0	2.0**	40.0	34.0	5.9**
Primary or less	19.1	22.5	-3.4**	10.7	16.0	-5.2**
Industry (% share)						
Agriculture and fisheries	20.3	20.7	-0.3	15.0	17.2	-2.1**
Mining	6.7	1.9	4.8**	8.6	2.0	6.6**
Manufacturing	20.4	22.5	-2.1**	19.9	23.5	-3.6**
Construction	6.2	5.8	0.4	6.2	6.0	0.3
Trade and hotels	13.1	13.3	-0.7	14.2	13.0	1.2
Transport and communications	5.4	5.7	-0.4	6.5	6.2	3.7
Financial and business services	4.5	4.1	0.4	4.3	4.3	0
Public service	19.6	23.1	-3.4**	21.3	24.6	-3.3**
Other services	3.8	3.1	0.8*	3.9	3.2	7.2
Sector (% share)						
Private	21.8	24.7	-2.9**	21.4	24.9	-3.6**
Self-employed	21.6	20.6	1.0	20.2	18.7	1.5
Unpaid family workers	5.7	4.8	0.9*	2.8	3.9	-1.1**
Local government	3.2	4.6	0.5**	3.9	5.2	-1.3**
Co-operatives	4.4	5.3	-1.4**	4.5	5.6	-1.1*
State sector	43.3	39.9	3.4**	47.2	41.3	5.6**
Occupation (% share)						
Professional, managerial and technical	29.3	26.9	2.4**	31.2	28.5	2.7**
Skilled non-manuals	7.3	6.8	0.4	7.6	7.4	1.7
Semi-skilled non manuals	8.3	9.5	-1.2**	9.2	9.4	-2.1
Farmers	19.1	18.1	1.0	13.5	14.7	-1.2
Skilled manuals	20.9	19.7	1.2	22.8	21.7	1.1
Semi-skilled manuals	8.1	8.3	-0.2	9.2	9.0	2.4
Low skilled manuals	7.0	10.6	-3.6**	6.5	9.3	-2.8**
Enterprise size (% share)						
5 or fewer employees	32.0	31.4	0.7	28.2	28.9	0.1
6 to 20 employees	13.3	16.0	-2.7**	13.7	16.2	-2.5**
21 to 50 employees	11.1	13.3	-2.2**	11.2	13.5	-2.3**
51 to 100 employees	8.3	10.1	-1.8**	9.1	10.4	-1.3
100 or more employees	35.2	29.1	6.1**	37.8	31.1	6.7**
Index of structural change						
By firm size	5.3	7.7	-2.4**	5.3	7.7	-2.4**
By sector	19.6	25.1	-5.5**	19.4	25.2	-5.8**
By industry	12.6	17.2	-4.6**	12.4	17.3	-4.8**
Herfindahl index of industrial concentration	12.1	9.6	2.6**	11.6	9.6	2.1**
Lilien index of industrial change	31.0	38.3	-7.3**	30.7	38.2	-7.5**
Average Unemployment rate	9.8	17.4				
Number of observations	4039	3565		2393	2179	

Source: Labour Force Survey.

Calculating inflows

We estimate the probability of flowing from employment into unemployment using data relative to the year from November 1995 to November 1996. The dummy for inflows is the status variable in the estimates of the hazard functions. It assumes value one for workers who were employed in November 1995, but declare one year later that they were not working during the reference week of the survey, because they did not have any job and were in search for it. Those who have lost their job at November 1996, but declare that they are not in search for a new one are not included in our inflow variable. This is because we want to concentrate on the dramatic event of job loss.

Moreover, those who have quitted their job and have found a new one within the year are supposed not to have had any unemployment spell in between. This choice is partly constrained by the nature of the data set: in fact, each of the waves used in the estimates is surveyed only once between the two points in time considered. This would not allow a more detailed reconstruction of eventual intermediate unemployment spells. Nonetheless, we apply the Newell and Pastore (1999) methodology to measure inflows to unemployment up to the last month before the second point of observation.

Table A7 provides information on the resulting inflow variable. In both groups of regions, the inflow rate is very low. This is typical of cross-section studies in contrast with cohort analyses.

Table A3: Inflow rates by groups of voivodships and of workers, 1995-96

	Employed workers		*Prime-aged workers*	
	Lowest unemployment voivodships	*Highest unemployment voivodships*	*Lowest unemployment voivodships*	*Highest unemployment voivodships*
Inflow (% share)	3.3	5.8	3.2	6.5
Observations	4039	3565	2395	2177

Source: Labour force survey.

Job tenure is the time variable. Questions relative to the past history of the workers are used to measure tenure until November 1995. As it is typical of cross section analysis contrasted with cohort analysis, information on past history contributes to determine very long average employment duration, ranging from 11.4 years for the high to 13.12 years for the low unemployment regions. Of course, information based on retrospective questions is less reliable than that based on current events, but we trust that the bias be small. It is surely irrelevant to our purposes. In fact, we are not interested in accurate estimates of the baseline, but simply in the direction of tenure dependence, if any exists.

Problems arise when measuring duration relative to the period from November 1995 to November 1996. The workers flowing into unemployment are split into two cases. The first case refers to workers who declared they had a job contract or were self-employed, albeit they did not work during the reference week. For this group, the measured tenure equals tenure to 1996 minus the period spent unemployed, as reported in a specific question. The second case refers to workers who had not any job contract and were not self-employed. The LFS does not include a specific question relative to the length of the actual spell of unemployment, but only a question relative to when the last job was lost. Measured tenure has been posed equal to tenure to 1995 minus half of the period from November 1995 to the date when the worker has lost his last job. It is assumed that another spell of unemployment may have possibly occurred during that period.

Table A4: Inflow hazard functions in low and high unemployment regions

	Lowest unemployment voivodships	*Highest unemployment voivodships*
age: below 25	-0.280***	-0.0007
Between 25 and 34	-0.078**	-0.093
Between 35 and 44	-0.004	0.013**
Between 45 and 64	-0.075	-0.196***
Completed education:		
University	-1.223***	-1.926***
Secondary	-0.396	-0.461**
Lower vocational	-0.241	-0.322*
Industry (default = manufacturing, mining and utilities)		
Agriculture	-1.552***	-0.502
Construction	0.499	0.509**
Retail trade	0.592*	-0.003
Hotels and restaurants	1.387***	0.832**
Business and financial services	0.568	0.468
Public services	0.663*	-0.296
Other services	0.65**	0.244
Sector (default = co-operatives)		
State sector	-0.213	1.172**
Private sector	0.799***	2.148***
Local government	0.214	1.920***
size of enterprise (default = more than 100 employees)		
Less than six employees	1.098***	1.343***
From 6 to 20 employees	0.757***	1.328***
From 21to 50 employees	0.894***	1.145***
From 51 to 100 employees	0.754**	0.571*
Number of observations	4086	3864

*Note: *, **, *** denote significance at the 10, 5 and 1 per cent levels.*

Endnotes

[i] Our three cohorts, or quasi-panels, are observed as follows. First we take all the respondents to the PLFS who are observed at November 1994 and November 1995. Second we take the respondents observed at both November 1995 and November 1996. Lastly we take the respondents observed at November 1996 and November 1997. The design of the PLFS ensures that no respondent appears in more than one of the above groups.

[ii] We replicate our results for the November 1994-1995 and November 1996-1997 quasi-panels, and these results are in the Appendix or available on request.

[iii] As discussed in Kiefer (1988), measuring transitions between different labour market states using intermittent cross-section surveys can lead to biased estimates. This is, among other reasons, because of the presence of unrecorded spells of unemployment intervening between two recorded employment spells. However, Góra and Lehmann (1995) find that the size of these problems is very low, almost irrelevant in the case of flows out of employment.

[iv] In unreported estimates based on the whole sample of voivodships, the coefficient was highly significant.

[v] The role of sectoral shifts and industrial diversification in the Italian regional unemployment is discussed in Caroleo (1992).

[vi] The taxonomy, developed by Neven (1995) using German data relative to the early 1990s, divides the manufacturing sector in five groups of industries. A first cluster includes advanced technology industries intensive in human capital and physical capital, such as the chemical industry. A second group of industries uses a relatively smaller amount of physical capital, but still produces jobs, which must be covered by workers with high human capital. It includes machinery, electrical, engineering and transport equipment sectors. The third cluster includes processes which use labour intensively, combined with relatively little physical capital. Such a configuration is typical of the production of leather and derivatives. The fourth group is composed of industries that use a relatively high share of labour and physical capital. This cluster includes textiles, wood and wooden products, rubber and plastic products and metal products. We include all firms categorised as other non-metallic products and other manufactures in this cluster. The final cluster is not homogeneous, since it includes the food industry and the production of coal, petroleum and derivatives. The common feature is the low level of diversification of production and the link with the production of raw agricultural and energy materials, which is mirrored in the relatively higher share of physical and human capital.

[vii] Whether this is due to genuine duration dependence or it is the reflex of unobserved heterogeneity will be the object of further research.